CS-205(Digital Electronics)

Second Class Test

Q1:-Simply the following expression.

(A) $\boldsymbol{Y = \overline{(AB + \overline{C})(\overline{A + B} + C)}}$

SOL.

$$Y = \overline{(AB + \overline{C})(\overline{A + B} + C)}$$

$$= \overline{(AB + \overline{C})(\overline{A}.\overline{B} + C)}$$

$$= \overline{AB.\overline{A}.\overline{B} + ABC + \overline{A}.\overline{BC} + C\overline{C}}$$

$$= \overline{0 + ABC + \overline{A}.\overline{B}\overline{C} + 0}$$

$$= \overline{ABC}.\overline{\overline{A}.\overline{B}\,.\overline{C}}$$

$$= (\overline{A} + \overline{B} + \overline{C}).(\overline{\overline{A}} + \overline{\overline{B}} + \overline{\overline{C}})$$

$$= (\overline{A} + \overline{B} + \overline{C}).(A + B + C)$$

(B)$\boldsymbol{Y = \overline{\overline{A\overline{B} + ABC} + A(B + A\overline{B})}}$

SOL. $\boldsymbol{Y = \overline{\overline{A\overline{B} + ABC} + A(B + A\overline{B})}}$

$$\boldsymbol{= \overline{\overline{A(\overline{B} + BC)} + A(B + A)}}$$

$$= \overline{\overline{A(\overline{B} + C)} + AB + A.A}$$

$$= \overline{\overline{A\overline{B} + AC} + A.1}$$

$$= \overline{\overline{A\overline{B} + AC} + A}$$

$$= \overline{(\overline{A\bar{B}}).(\overline{AC}) + A}$$

$$= \overline{(\bar{A} + B).(\bar{A} + \bar{C}) + A}$$

$$= \overline{(\bar{A} + B\bar{C}) + A}$$

$$[(A + B)(A + C) = A + BC]$$

$$= \overline{\bar{A} + B\bar{C} + A}$$

$$\overline{= 1 + B\bar{C}}$$

$$= \bar{1}$$

$$= 0 \qquad [1 + X = 1]$$

Que2 (a) **Obtain the canonical Sum product(SOP) form of the function.**

Y=AB+ACD

SOL. Y=AB+ACD

$$= AB(C + \bar{C})(D + \bar{D}) + ACD(B + \bar{B})$$

$$= (ABCD + AB\bar{C})(D + \bar{D}) + ABCD + A\bar{B}CD$$

$$= ABCD + ABC\bar{D} + AB\bar{C}D + AB\bar{C}\bar{D} + ABCD + A\bar{B}CD$$

[ABCD+ABCD=ABCD]

$$= ABCD + ABC\bar{D} + AB\bar{C}D + AB\bar{C}\bar{D} + A\bar{B}CD$$

(b) Obtain the canonical Product of sum(POS) form of the function.

$Y = A + \bar{B}C$

SOL. $Y = A + \bar{B}C$

$$=(A + \bar{B})(A + C)$$

[A+BC=(A+B)(A+C)]

$$= (A + B + C\bar{C})(A + C + B\bar{B})$$

$$=(A + \bar{B} + C)(A + \bar{B} + \bar{C})(A + B + C)(A + \bar{B} + C)$$

$$[(A + B)(A + \bar{B}) = A]$$

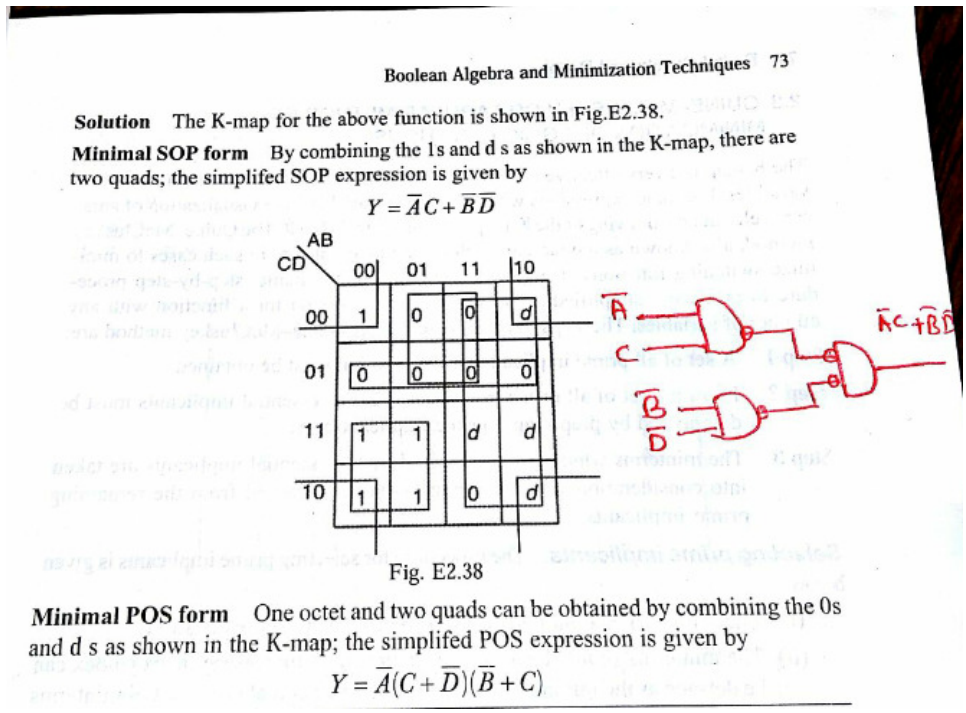
$$=(A+\bar{B}+C)(A+\bar{B}+\bar{C})(A+B+C)$$

$Y=M_2M_3M_0$ OR $Y=M_0M_2M_3$

Therefore, $Y=\pi(0,2,3)$

QUE3. Using the K –map simplifies the following Boolean function and draws the logic diagram using NAND/NAND gates.

$$Y=\sum m\ (0,2,3,6,7)+d(8,10,11,15)$$



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Solution The K-map for the above function is shown in Fig.E2.38.

Minimal SOP form By combining the 1s and d s as shown in the K-map, there are two quads; the simplifed SOP expression is given by

$$Y=\bar{A}C+\bar{B}\bar{D}$$

Fig. E2.38

Minimal POS form One octet and two quads can be obtained by combining the 0s and d s as shown in the K-map; the simplifed POS expression is given by

$$Y=\bar{A}(C+\bar{D})(\bar{B}+C)$$